Physical Review B - Condensed Matter and Materials Physics 2004 vol.70 N7, pages 075112--075112-9

Optical spectroscopy of Yb2Ti2O7 and Y2Ti2O7: Yb3+ and crystal-field parameters in rare-earth titanate pyrochlores

Malkin B., Zakirov A., Popova M., Klimin S., Chukalina E., Antic-Fidancev E., Goldner P., Aschehoug P., Dhalenne G.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Optical absorption spectra of the Yb2Ti2O7 single crystals and luminescence spectra of the Y2Ti 2O7:Yb (1%) polycrystalline samples were registered at temperatures 4.2-300 K. These spectra and earlier published data on magnetic properties of Yb3+ ions and on the temperature dependence of the electric field gradient at Yb nuclei in Yb2Ti2O 7 were used to analyze the crystal-field parameters in rare-earth titanates with the pyrochlore structure. The self-consistent sets of crystal-field parameters for rare-earth ions in the 16d sites with the D 3d symmetry that describe satisfactory all known single-ion magnetic properties and low-energy excitations in R2Ti2O 7 crystals (R=Tb, Ho, Er, Tm, Yb) are presented.

http://dx.doi.org/10.1103/PhysRevB.70.075112